

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 037 201 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:  
20.09.2000 Bulletin 2000/38

(51) Int. Cl.<sup>7</sup>: G11B 5/54, G11B 21/22

(21) Application number: 00113312.3

(22) Date of filing: 21.08.1998

(84) Designated Contracting States:  
DE FR GB

(30) Priority: 27.11.1997 KR 9763444  
30.12.1997 KR 9777801

(62) Document number(s) of the earlier application(s) in  
accordance with Art. 76 EPC:  
98306704.2 / 0 919 991

(71) Applicant:  
SAMSUNG ELECTRONICS CO., LTD.  
Suwon-City, Kyungki-do (KR)

(72) Inventor: Jang, Deok-hwan  
Paldal-gu, Suwon-city, Kyungki-do (KR)

(74) Representative:  
Perry, Julie Elizabeth  
15 Clare Road  
Halifax, West Yorkshire HX1 2HY (GB)

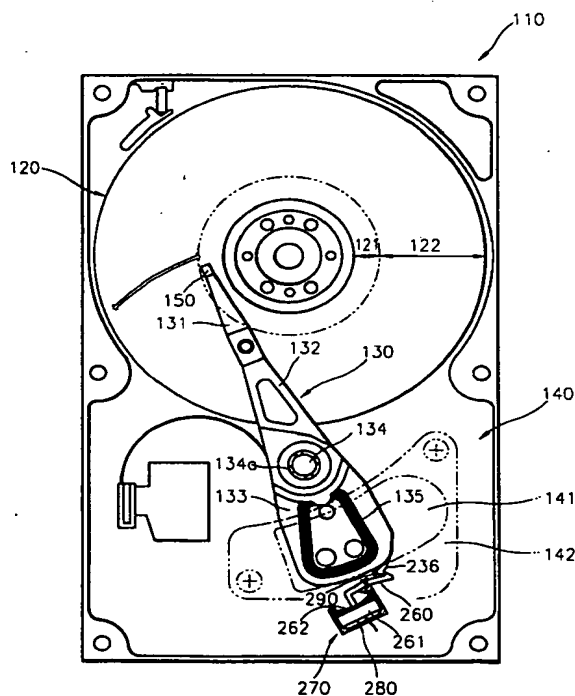
Remarks:

This application was filed on 23 - 06 - 2000 as a  
divisional application to the application mentioned  
under INID code 62.

(54) Magnetic head transferring device of hard disk drive

(57) In a magnetic head transferring device of a hard disk drive, to lock a rotor after the magnetic head is moved to a parking zone (121) formed on a hard disk (120), a bi-metal member (160) reversibly deforms when heated by an electric current supplied from a power supply source. The rotor (130) has a coupling slot (136) through which one side of the bi-metal member (160) selectively inserts into or separates from as the bi-metal member deforms. Thus, since the rotation of the rotor (130) is locked or unlocked using the bi-metal member operating according to the turning on/off of power, an abnormal movement of the magnetic head (150) can be prevented regardless of the strength of external impacts.

FIG. 5



## Description

**[0001]** The present invention relates to a magnetic head transferring device of a hard disk drive, and more particularly, to a magnetic head transferring device of a hard disk drive having an improved structure for locking a magnetic head in a parking zone.

**[0002]** As shown in Figure 1, a general hard disk drive is comprised of a hard disk 20 rotatably installed on a base 10 for storing information and a magnetic head transferring device for moving a magnetic head 50 to a desired track position on the hard disk 20 to read and write information. Here, the surface of the hard disk 20 is divided into two sections: a recording zone 22 in which information is recorded and a parking zone 21 provided at the inner side of the hard disk 20 where the magnetic head 50 is placed when the rotation of the hard disk 20 stops.

**[0003]** The magnetic head transferring device has a rotor 30 installed to be capable of pivoting around a pivot shaft 34 provided on the base 10 and on which the magnetic head 50 is mounted, a stator 40 for actuating the rotor 30 to pivot by an electromagnetic force, and a locking means for locking the rotor 30 after the magnetic head 50 is placed in the parking zone 21. The rotor 30 is comprised of a suspension portion 31 for supporting the magnetic head 50, a swing arm 32 installed to be capable of pivoting around the pivot shaft 34 via pivot bearings 34a, and a bobbin 33 around which a coil 35 for generating an electromagnetic force is wound. The stator 40 has a magnet 41 and a yoke 42 for forming a magnetic field. Thus, as an electromagnetic force is generated due to interaction between the magnetic field generated by the magnet 41 and the yoke 42, and the current flowing through the coil 35, the rotor 30 pivots in a direction according to Fleming's left-hand rule.

**[0004]** The locking means is comprised of a magnetic member 43 installed on the stator 40, a damper 60 coupled to a protrusion 36 provided at an end of the bobbin 33 of the rotor 30, and a magnetic plate 61 which is bonded at an end of the damper 60. When the magnetic head 50 installed at the suspension portion 31 enters the parking zone 21 of the hard disk 20 as the rotor 30 is pivoted, the magnetic plate 61 combined to the bobbin 33 is attracted and stuck to the magnetic member 43, as shown in the drawing. Thus, the rotor 30 remains in a locked state in which the magnetic plate 61 and the magnetic member 43 are stuck to each other, unless an electromagnetic force for pivoting the rotor 30 operates again.

**[0005]** However, in the conventional locking means as described above, since the rotor 30 is locked by the magnetic force generated between the magnetic plate 61 and the magnetic member 43, when an impact stronger than the magnetic force is applied in the locked state, the locked state is released. Also, in order to pivot the locked rotor 30 again, the electromagnetic force generated by the coil 35 and the magnetic member 41

must be greater than the magnetic force by which the magnetic plate 61 and the magnetic member 43 are stuck together. That is, in the case that the magnetic force between the magnetic plate 61 and the magnetic member 43 is smaller than that between the coil 35 and the magnet 41, the locking of the rotor 30 can be easily released by a small external impact, whereas, if it is made to be stronger, the rotor 30 does not unlock well by generating an electromagnetic force.

**[0006]** With a view to solve or reduce the above problem it is an aim of preferred embodiments of the present invention to provide a magnetic head transferring device of a hard disk drive in which a magnetic head is so firmly locked that it is not released by external impacts regardless of the strength of impact but can be easily unlocked if desired.

**[0007]** According to an aspect of the invention, there is provided a magnetic head transferring device of a hard disk drive including a rotor installed to be capable of rotating about a pivot shaft member provided on a base and having a magnetic head for reading/writing information from/on said hard disk, a stator for rotating said rotor such that said magnetic head can move across a parking zone and a recording zone formed on said hard disk and a locking means for locking said rotor to not move when said magnetic head is positioned on the parking zone of said hard disk, characterised in that said locking means comprises a bi-metal member which when in a first state is arranged to lock said rotor and, when said bi-metal member is in a second state, to release said rotor to allow the rotor to move from the parking zone to the recording zone passage from one state to the other state being brought about by selective reversible deformation of the bi-metal member due to heating by an electric current supplied from a predetermined power supply source.

**[0008]** The bi-metal member may be installed at one end portion of the pivot shaft member and a coupling slot is provided in the rotor such that, when the bi-metal member is in the first state, relative rotation of the rotor and the pivot shaft is inhibited.

**[0009]** The locking means may comprise a first hook portion attached to the rotor; a link member having a second hook portion for preventing rotation of the rotor by being elastically and selectively coupled to the first hook portion; the bi-metal member being installed to be adjacent to an actuating part of the link member and, when being heated by a predetermined heating source, deforming to enable movement of the link member such that the second hook portion can separate from the first hook portion; and a resilient member for resiliently biasing said link member so that said second hook portion can move toward the first hook portion to be able to be coupled to each other.

**[0010]** A rod member may be provided for pushing the actuating part of said link member as said bi-metal member deforms is interposed between the bi-metal member and the actuating part of the link member. A

rubber member for buffering may be provided at an end portion of said rod member contacting the actuating part of said link member.

[0011] Said locking means may comprise: a protrusion provided to one side of said rotor; a first lever member, rotatably installed on the base, for restricting rotation of the rotor by contacting one side surface of the protrusion when said magnetic head is located in the parking zone; the bi-metal member installed so as to be adjacent to an actuating part of said first lever member and, when being heated by a predetermined heating source, deforming so as to push one side of the first lever member so that the first lever member can be detached from said protrusion; a hook pin provided on the base; a second lever member coupled to the first lever member and capable of contacting the other side surface of the protrusion and having a hook portion to be hooked by the hook pin, the second lever member locking said first lever member and said hook portion is hooked by said hook pin when said first lever member rotates in a direction to be detached from the protrusion and is pushed by being in contact with the other side of the protrusion as said rotor rotates such that said magnetic head is located in the parking zone so that said hook portion is released from said hook pin; and a resilient biasing means for resiliently biasing said first lever member in a direction so as to contact one side surface of the protrusion.

[0012] A rod member may be provided for pushing the first lever member according to deformation of the bi-metal member is installed between said bi-metal member and said first lever member and a rubber member for buffering may be provided at one end portion of said rod member contacting said lever member.

[0013] A rubber member for buffering is respectively provided at one side surface and the other side surface of said protrusion contacting said first and second lever members.

[0014] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1 is a plan view illustrating the magnetic head transferring device apparatus of a conventional hard disk drive;

Figure 2 is a plan view illustrating a magnetic head transferring device according to a first preferred embodiment of the present invention;

Figure 3 is a sectional view taken along line III-III of Figure 2, showing a locked state of the magnetic head transferring device;

Figure 4A is a sectional view taken along line III-III of Figure 2, showing an unlocked state of the mag-

netic head transferring device;

Figure 4B is a side view schematically showing the unlocked state of the magnetic head transferring device shown in Figure 4A;

Figure 5 is a plan view illustrating a magnetic head transferring device according to a second preferred embodiment of the present invention;

Figures 6 and 7 are plan views for showing the major actions of the magnetic head transferring device shown in Figure 5;

Figure 8 is a plan view showing another example of the magnetic head transferring device according to the second preferred embodiment of the present invention shown in Figure 5;

Figure 9 is a plan view showing magnetic head transferring device according to a third preferred embodiment of the present invention;

Figures 10 and 11 are plan views for showing the major actions of the magnetic head transferring device shown in Figure 9; and

Figure 12 is a plan view showing another example of the magnetic head transferring device according to the third preferred embodiment of the present invention shown in Figure 9.

[0015] Figures 2 through 4B show a magnetic head transferring device of a hard disk drive according to a first preferred embodiment of the present invention. Referring to Figure 2, the magnetic head transferring device is comprised of a pivot shaft member 134 fixed on a base 110 on which a hard disk drive 120 is installed, a rotor 130 having a magnetic head 150 mounted at one end thereof, pivot bearings 134a for supporting the rotor 130 to rotate about the pivot shaft member 134, and a stator 140 for actuating the rotor 130 to allow the magnetic head 150 to move across a parking zone 121 and a recording zone 122 formed on the surface of the hard disk 120. Here, the rotor 130 consists of a suspension portion 131 for supporting the magnetic head 150, a swing arm 132 rotatably coupled to the pivot bearings 134a provided on the base 110, and a bobbin 133 around which a coil 135 for generating an electromagnetic force is wound. The stator 140 consists of a magnet 141 and a yoke 142 for generating a magnetic field.

[0016] Also, as a locking means for locking the rotor 130 when the magnetic head 150 is positioned in the parking zone 131 of the hard disk 130, there is provided a bimetal member 160 installed at an end of the pivot shaft member 134 and is reversibly deformed by being heated by an electric current applied from a predeter-

mined supply source, and a coupling slot 136 formed on the swing arm 132 of the rotor 130 such that one end portion of the bimetal member 160 can be selectively inserted therein or separated therefrom as the bimetal member 160 deforms. Referring to Figure 3, in the bimetal member 160, an upper metal 160a has a thermal expansion coefficient that is lower than that of a lower metal 160b so that both ends of the bimetal member 160 can bend upward as it is heated. Reference numerals 161 and 170 indicate a holder for supporting the bimetal member 160 and a lead wire for supplying an electric current to the bimetal member 160, respectively. Preferably, a power supply source for driving the hard disk 120 is also used for the bimetal member 160.

**[0017]** In the above-described structure, when power is turned on, an electric current is supplied to the bimetal member 160 through the lead wire 170 and, due to resistance heat generated by the current, the bimetal member 160 thermally expands. Here, since a metal member exhibiting a lower thermal expansion coefficient is disposed in the upper portion of the bimetal member 160, as shown in Figures 4A and 4B, the bimetal member 160 bends upward. Accordingly, both end portions of the bimetal member 160 is separated from the coupling slot 136 so that the rotor 130 including the swing arm 132 can rotate. Thus, the magnetic head 150 mounted on the rotor 130 can be smoothly moved to a desired position on the hard disk 120.

**[0018]** When power is turned off and the rotation of the hard disk 120 stops, an electromagnetic force is generated by the coil 135 and the magnet 141, and the rotor 130 pivots such that the magnetic head 150 can enter the parking zone 121. Thereafter, as power is turned off, the hard disk 120 stops rotating and lifting of the magnetic head 150 disappears so that the magnetic head 150 can be placed in the parking zone 121. Also, since the current supplied to the bimetal member 160 is no longer supplied, the thermal source which heats the bimetal member 160 disappears. Accordingly, the thermally expanded bimetal member 160 returns to its original flat shape, as shown in Figure 3, and both end portions thereof insert into the coupling slot 136 (see Figure 4B) provided in the swing arm 132 of the rotor 130. That is, the hard disk 120 rotates further due to the force of inertia and then is stopped as the bimetal member 160 is coupled to the coupling slot 136. Accordingly, since the bimetal member 160 serves as a latch so that the rotation of the swing arm 132 is completely prevented, even a strong impact can not push the magnetic head positioned in the parking zone 121 to a position in the recording zone 122. As described above, since the rotor 130 is locked and unlocked by the bimetal member 160, the locking is not released by a strong impact. Also, the unlocking action is easily performed by turning on the power.

**[0019]** Next, Figures 5 through 8 show a magnetic head transferring device of a hard disk according to a second preferred embodiment of the present invention.

In the drawings, the same reference numerals as in the description of the first preferred embodiment indicate the same elements. In the present embodiment, a locking means for locking the rotor 130 when the magnetic head 150 is located in the parking zone 121 of the hard disk 120 includes a first hook portion 236 provided at the end portion of the rotor 130, a link member 260 having a second hook portion 260a which is elastically coupled to the first hook portion 236, an elastic member such as a tension spring 263 for supplying an elastic force to the link member such that the second hook portion 260a can be coupled to the first hook portion 236, and a bimetal member 262 for rotating the link member 260 in a direction such that the second hook portion 260a is separated from the first hook portion 236. Here, the bimetal member 262 is housed in a predetermined case 270 and the link member 260 is hinge-coupled at one side of the case 270.

**[0020]** Also, the bimetal member 262 is heated by a heating plate 261 which is heated according to the supply of current. When heated, the bimetal member 262 deforms as indicated by a double-dot-dashed line and pushes one end of the link member 260, as shown in Figure 6. In the bimetal member 262, the thermal expansion coefficient of an upper metal member 262a is higher than that of a lower metal member 262b so that the mid-portion of the bimetal member 262 deforms to be bent upward as the temperature of the bimetal member 262 increases. Reference numerals 280 and 290 indicate a lead wire for supplying an electric current to the heating plate 261 and a stopper for restricting the rotational range of the rotor 130, respectively.

**[0021]** In the locking means having the above structure, when power is turned on, an electric current is supplied to the heating plate 261 through the lead wire 280. Accordingly, resistance heat is generated and transferred to the bimetal member 262 so that the bimetal member 262 begins to thermally expand. Here, since the upper metal member 262a of the bimetal member 262 has a higher thermal expansion coefficient than the lower metal member 262b, the mid-portion of the bimetal member 260 deforms to be bent upward. Accordingly, the mid-portion of the bimetal member 262 pushes up one end portion of the link member 260 to rotate clockwise on the drawing so that the second hook portion 260a is detached from the first hook portion 236. Then, the rotor 130 can rotate and the magnetic head 150 mounted on the rotor 130 can freely move to a desired position on the hard disk 120. After the rotor 130 rotates so that the magnetic head 150 is moved to the recording zone 122 of the hard disk 120, as shown in Figure 7, the current supplied to the heating plate 261 is cut off. Then, the bimetal member 260 returns to the initial position and the link member 260 also returns to the initial position by the tension spring 263, i.e., a position where the second hook portion 260a can latch the first hook portion 236 of the rotor 130.

**[0022]** When power is turned off and the rotation of

the hard disk 120 stops, an electromagnetic force is generated in the magnetic field generated between the coil 135 and the magnet 141, and the rotor 130 is thereby rotated such that the magnetic head 150 can enter the parking zone 121. Accordingly, the first hook portion 236 is elastically coupled to the second hook portion 260a which returns to its initial position so that the rotor 130 is locked as shown in Figure 6. As power is turned off, the rotation of the hard disk 120 stops and the lifting of the magnetic head 150 disappears, so that the magnetic head 150 is placed on the parking zone 121.

**[0023]** As described above, in the magnetic head transferring device according to the present embodiment, since the rotor 130 is locked using the first and second hook portions 236 and 260a, the locking is not released by a strong impact. Also, unlocking of the rotor 130 can be easily performed by deforming the bimetal member 262 to separate the first and second hook portions 236 and 260a.

**[0024]** Although, in the second preferred embodiment, one end portion of the link member 260 directly contacts the mid-portion of the bimetal member 262 to be pushed according to the deformation of the bimetal member 262, a rod member 271 elastically supported by a compression spring 273 can be interposed between the bimetal member 262 and the link member 260', as shown in Figure 8, so that one end portion of the rod member 271 can push up the link member 260'. Here, a rubber 272 can further be provided to prevent impact and abrasion between the rod member 271 and the link member 260'.

**[0025]** Next, Figures 9 through 12 show a magnetic head transferring device according to a third preferred embodiment of the present invention. In the drawings, the same reference numerals as in the description of the first preferred embodiment indicate the same elements.

**[0026]** Referring to the drawing, the locking means for locking the rotor 130 includes a protrusion 370 formed on one end portion of the rotor 130, a first lever member 364 installed to be capable of rotating about a rotation shaft 364a provided on the base 110 for restricting rotation of the rotor 130 by being in contact with one side surface of the protrusion 370 when the magnetic head 150 is placed in the parking zone 121, a bimetal member 330 which deforms to be able to press one end of the first lever member as a heating plate 320 is heated according to the supply of current, a second lever member 365 coupled to the first lever member 364 to be capable of contacting the other side surface 372 of the protrusion 370 and having a hook portion 365a formed at one end thereof to be coupled to a hook pin 366 provided on the base 372, and a compression spring 340 for elastically biasing the first lever member 364 to contact one side surface 371 of the protrusion 370.

**[0027]** Here, the second lever member 365 rotated

together with the first lever member 364. When the first lever member 364 is rotated in a direction to separate from the protrusion 370, the hook portion 365a of the second lever member 365 is coupled to the hook pin 366 so that the rotation of the first lever member 364 is locked. When the rotor 130 rotates such that the magnetic head 150 is placed in the parking zone 121, the second lever member 365 is pressed by being in contact with the other side surface 372 of the protrusion 370 so that coupling between the hook portion 365a and the hook pin 366, by which the rotation of the first lever member 364 is restricted, is released.

**[0028]** Reference numerals 391, 310, and 350 indicate a stopper for restricting the range of rotation of the rotor 130, a case in which the heating plate 320 and the bimetal member 330 are housed, and a lead wire through which an electric current is supplied to the heating plate, respectively.

**[0029]** In the locking means having the above structure, when power is turned on, an electric current is supplied to the heating plate 320 through the lead wire 350. Then, resistance heat is generated and transferred to the bimetal member 330 so that the bimetal member 262 thermally expands. As a result, as shown in Figure 10, the mid-portion of the bimetal member 330 deforms to be bent upward. Accordingly, the mid-portion of the bimetal member 330 pushes up one end portion of the first lever member 364 to rotate clockwise on the drawing so that the first lever member 364 is detached from the one side surface of the protrusion 370. Then, the rotor 130 can rotate and the magnetic head 150 mounted on the rotor 130 can freely move to a desired position on the hard disk 120.

**[0030]** Here, the second lever member 365 rotates clockwise as the first lever member 364 rotates and the hook portion 365a is hooked by the hook pin 366. When the hook portion 365a is hooked by the hook pin 366 as above, the first and second lever members 364 and 365 stop rotating, if no additional external force is applied. Also, as the locking is released, the rotor 130 rotates such that the magnetic head 150 can move to the recording zone 122 of the hard disk 120 and the supply of current to the heating plate 320 is cut off. Then, the bimetal member 330 returns to its original shape. However, the first and second lever members 364 and 365 stand still in a state in which the hook portion 365a is hooked by the hook pin 366.

**[0031]** When power is turned off to stop the rotation of the hard disk 120, an electromagnetic force is generated in the magnetic field generated between the coil 135 and the magnet 141, and the rotor 130 is rotated such that the magnetic head 150 can move to the parking zone 121. Here, as the other side surface 372 of the protrusion 370 contacts the second lever member 365, the second lever member 365 is pushed counterclockwise on the drawing.

**[0032]** Accordingly, the hook portion 365a hooked by the hook pin 366 is released and simultaneously the

first lever member 364 is rotated to its original position by an elastic force of the tension spring 340. Thus, as shown in Figure 11, since the first lever member 364 returns to the position to contact the one side surface 371 of the protrusion 370, the rotor 130 is locked to not rotate any further. Thereafter, as power is turned off, the rotation of the hard disk 120 stops and the lifting of the magnetic head 150 disappears, so that the magnetic head 150 is placed on the parking zone 121.

[0033] Meanwhile, the third preferred embodiment of the present invention can be modified as shown in Figure 12, that is, a rod member 374 which can be elastically reversed by a compression spring 376 is interposed between the bimetal member 330 and the first lever member 364' so that an end portion of the rod member 374 can push the first lever member 364'. Here, a rubber member 375 is preferably installed at the end portion of the rod member 374 to absorb impacts or prevent abrasion. Also, rubber members are preferably installed at the one side surface 371 and the other side surface 372 of the protrusion 370 contacting the first and second lever members 364 and 365, respectively, to obtain buffering and anti-abrasion effects.

[0034] As described above, in the magnetic head transferring device of a hard disk drive according to embodiments of the present invention, since the rotation of the rotor is locked or unlocked using the bimetal member operating according to the turning on/off of power, an abnormal movement of the magnetic head can be prevented regardless of the strength of external impacts.

[0035] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0036] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0037] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0038] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

## Claims

1. A magnetic head transferring device of a hard disk drive including a rotor (130) installed to be capable of rotating about a pivot shaft member (134) provided on a base (110) and having a magnetic head (150) for reading/writing information from/on said hard disk (120), a stator (140) for rotating said rotor (130) such that said magnetic head (150) can move across a parking zone (121) and a recording zone (122) formed on said hard disk (120) and a locking means for locking said rotor (130) to not move when said magnetic head (150) is positioned on the parking zone (121) of said hard disk (120), wherein said locking means comprises a bi-metal member (160, 262) which when in a first state is arranged to lock said rotor (130) and, when said bi-metal member (160, 262, 330) is in a second state, to release said rotor (130) to allow the rotor (130) to move from the parking zone (121) to the recording zone (122) passage from the one state to the other state being brought about by selective reversible deformation of the bi-metal member due to heating by an electric current supplied from a predetermined power supply source, characterised in that the locking means comprises a first hook portion (236) attached to the rotor (130); a link member (260) having a second hook portion (260a) for preventing rotation of the rotor (130) by being elastically and selectively coupled to the first hook portion (236); the bi-metal member (262) being installed to be adjacent to an actuating part of the link member (260) and, when being heated by a predetermined heating source, deforming to enable movement of the link member such that the second hook portion (260a) can separate from the first hook portion (236); and a resilient member (263) for resiliently biasing said link member (260) so that said second hook portion (260a) can move toward the first hook portion (236) to be able to be coupled to each other.
2. A device according to claim 1, wherein a rod member (271) for pushing the actuating part of said link member as said bi-metal member (262) deforms is interposed between the bi-metal member (262) and the actuating part of the link member (260).
3. The device of claim 2, wherein a rubber member (262) for buffering is provided at an end portion of said rod member (271) contacting the actuating part of said link member (260).
4. A magnetic head transferring device of a hard disk drive including a rotor (130) installed to be capable of rotating about a pivot shaft member (134) provided on a base (110) and having a magnetic head (150) for reading/writing information from/on said hard disk (120), a stator (140) for rotating said rotor

(130) such that said magnetic head (150) can move across a parking zone (121) and a recording zone (122) formed on said hard disk (120) and a locking means for locking said rotor (130) to not move when said magnetic head (150) is positioned on the parking zone (121) of said hard disk (120), wherein said locking means comprises a bi-metal member (160, 262) which when in a first state is arranged to lock said rotor (130) and, when said bi-metal member (160, 262, 330) is in a second state, to release said rotor (130) to allow the rotor (130) to move from the parking zone (121) to the recording zone (122) passage from the one state to the other state being brought about by selective reversible deformation of the bi-metal member due to heating by an electric current supplied from a predetermined power supply source, characterised in that said locking means comprises:

a protrusion (370) provided to one side of said rotor (130);

a first lever member (364), rotatably installed on the base (110), for restricting rotation of the rotor (130) by contacting one side surface of the protrusion (370) when said magnetic head (150) is located in the parking zone (121);

the bi-metal member (330) installed so as to be adjacent to an actuating part of said first lever member (364) and, when being heated by a predetermined heating source (320), deforming so as to push one side of the first lever member (364) so that the first lever member (364) can be detached from said protrusion (370);

a hook pin (366) provided on the base (110);

a second lever member (365) coupled to the first lever member (364) and capable of contacting the other side surface of the protrusion (370) and having a hook portion (365a) to be hooked by the hook pin (366), the second lever member (365) locking said first lever member (364) and said hook portion (365a) is hooked by said hook pin (366) when said first lever member (364) rotates in a direction to be detached from the protrusion (370) and is pushed by being in contact with the other side of the protrusion (370) as said rotor (130) rotates such that said magnetic head (150) is located in the parking zone (121) so that said hook portion (365a) is released from said hook pin (366); and

a resilient biasing means for resiliently biasing said first lever member (364) in a direction so

as to contact one side surface of the protrusion (370).

5. The device of claim 4, wherein a rod member (374) for pushing the first lever member (364) according to deformation of the bi-metal member (330) is installed between said bi-metal member (330) and said first lever member (364).

6. A device according to claim 5, wherein a rubber member (375) for buffering is provided at one end portion of said rod member (374) contacting said lever member (364).

7. A device according to any of claims 4 to 6, wherein a rubber member (391) for buffering is respectively provided at one side surface and the other side surface of said protrusion (370) contacting said first and second lever members (364, 365).

8. A magnetic head transferring device of a hard disk drive including a rotor (130) installed to be capable of rotating about a pivot shaft member (134) provided on a base (110) and having a magnetic head (150) for reading/writing information from/on said hard disk (120), a stator (140) for rotating said rotor (130) such that said magnetic head (150) can move across a parking zone (121) and a recording zone (122) formed on said hard disk (120) and a locking means for locking said rotor (130) to not move when said magnetic head (150) is positioned on the parking zone (121) of said hard disk (120), wherein said locking means comprises a bi-metal member (160, 262) which when in a first state is arranged to lock said rotor (130) and, when said bi-metal member (160, 262, 330) is in a second state, to release said rotor (130) to allow the rotor (130) to move from the parking zone (121) to the recording zone (122) passage from the one state to the other state being brought about by selective reversible deformation of the bi-metal member due to heating by an electric current supplied from a predetermined power supply source, characterised in that the bi-metal member (160; 262) is located adjacent an actuating part of a lever (364) or link member (260) such that, when the bi-metal member (160; 262) is heated by a predetermined heating source and thereby deforms, inter-engaged first and second hook portions (236, 260a) on the rotor (130) and link member (260) respectively may be disengaged, or the lever (364) may be detached from a protrusion (370) on the rotor (130).

FIG. 1 (PRIOR ART)

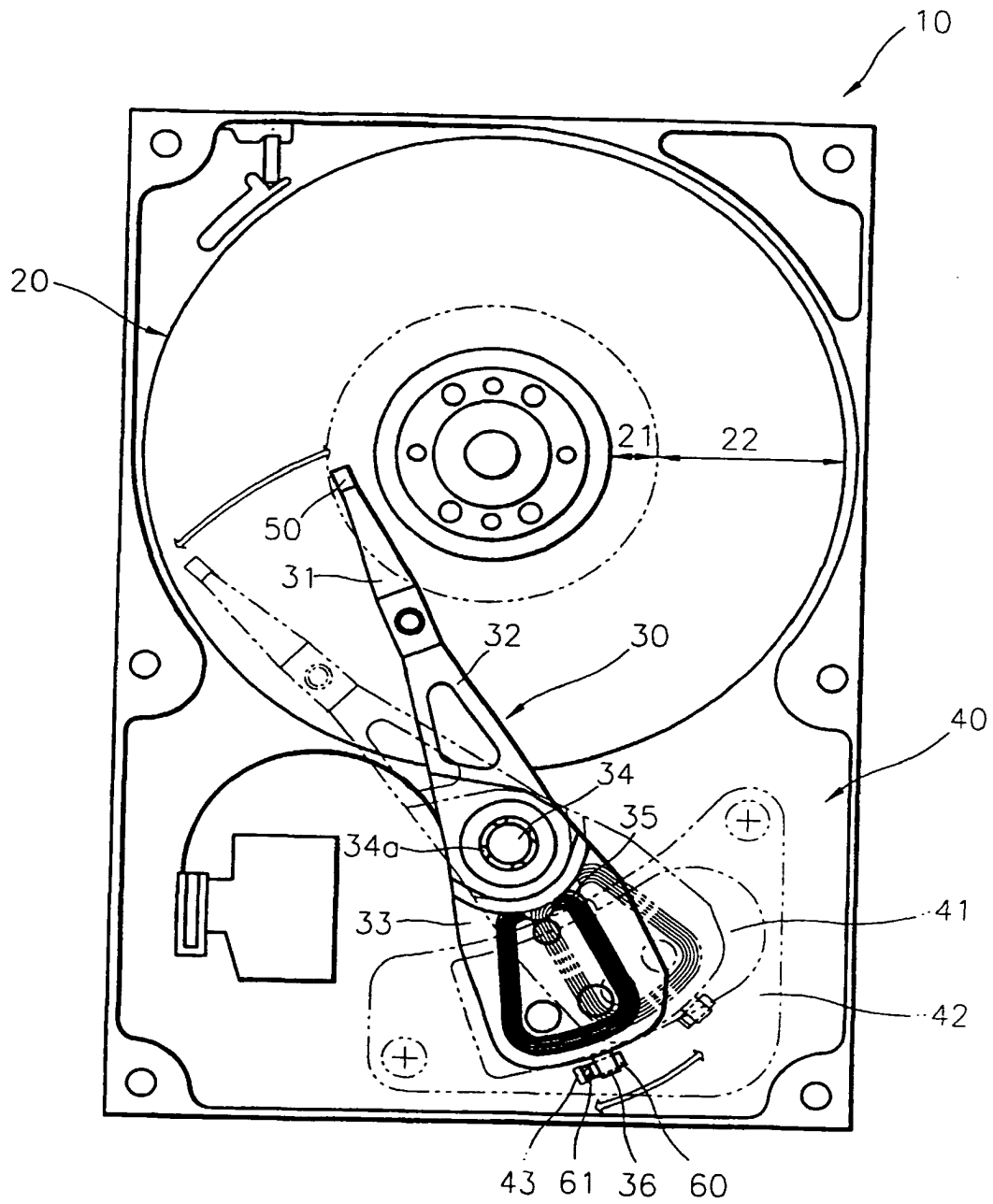




FIG. 2

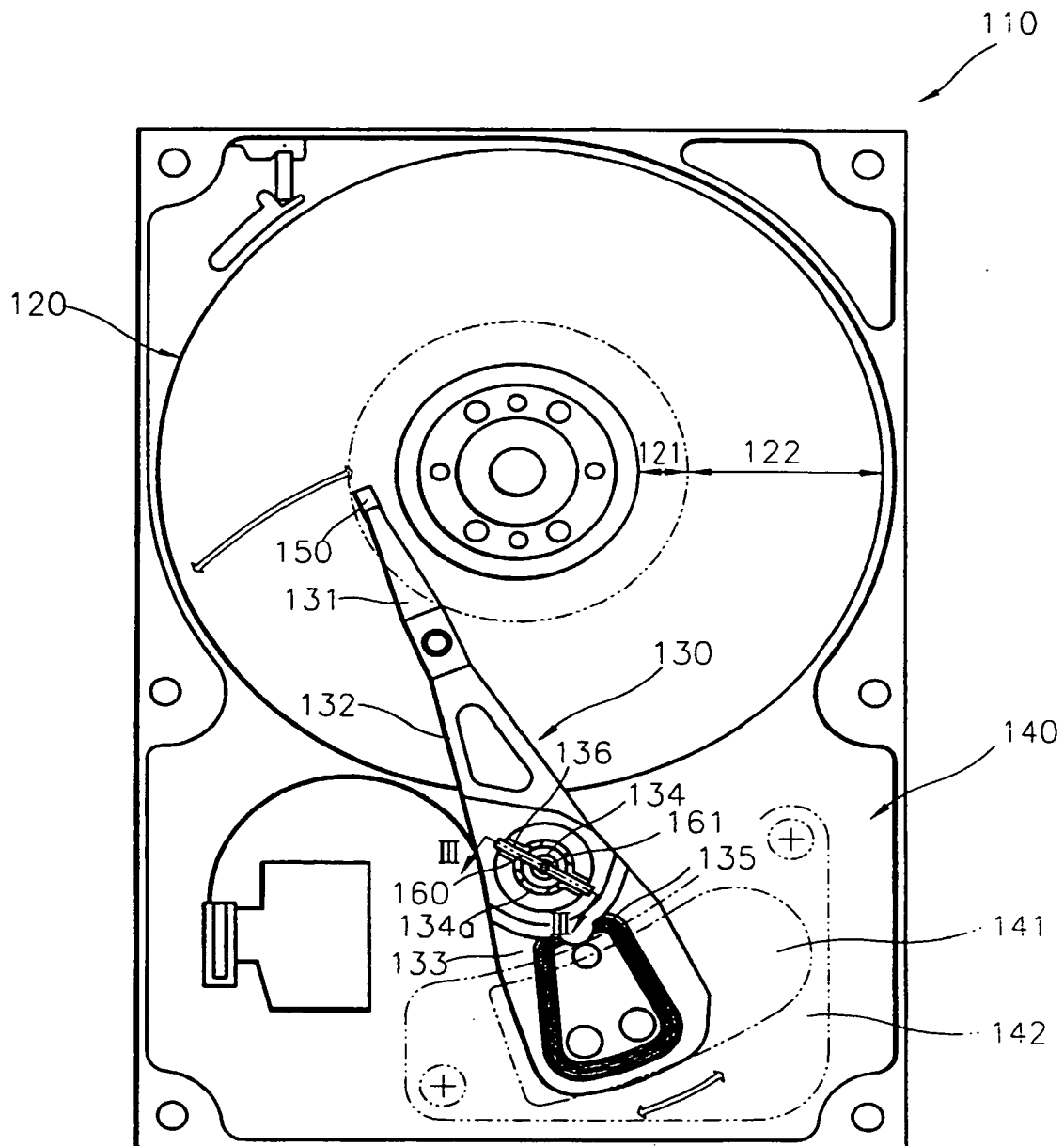


FIG. 3

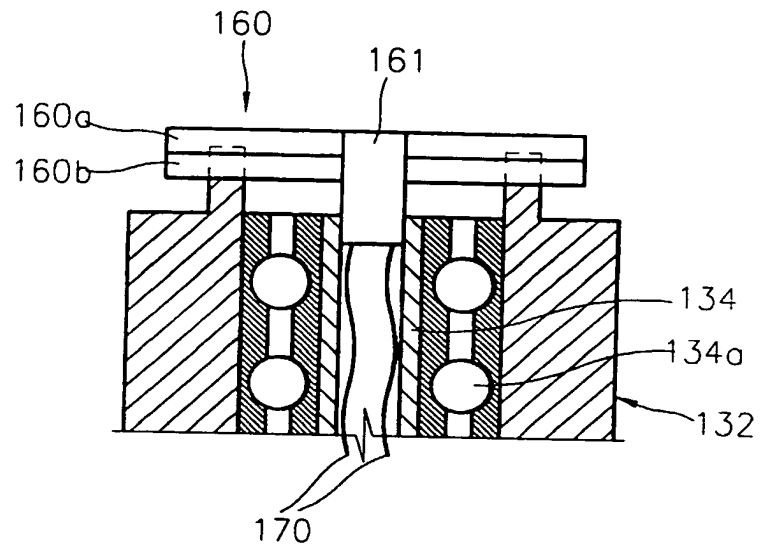


FIG. 4A

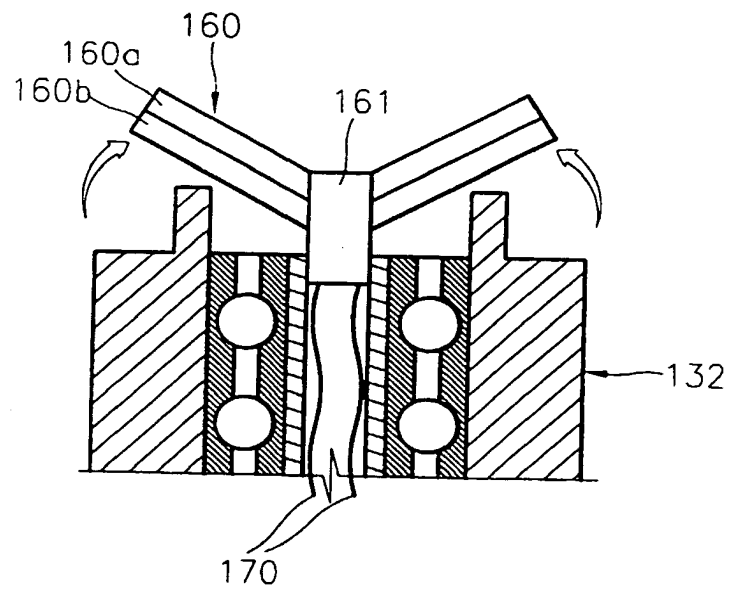


FIG. 4B

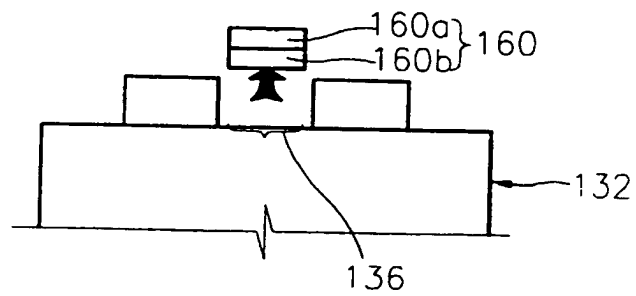


FIG. 5

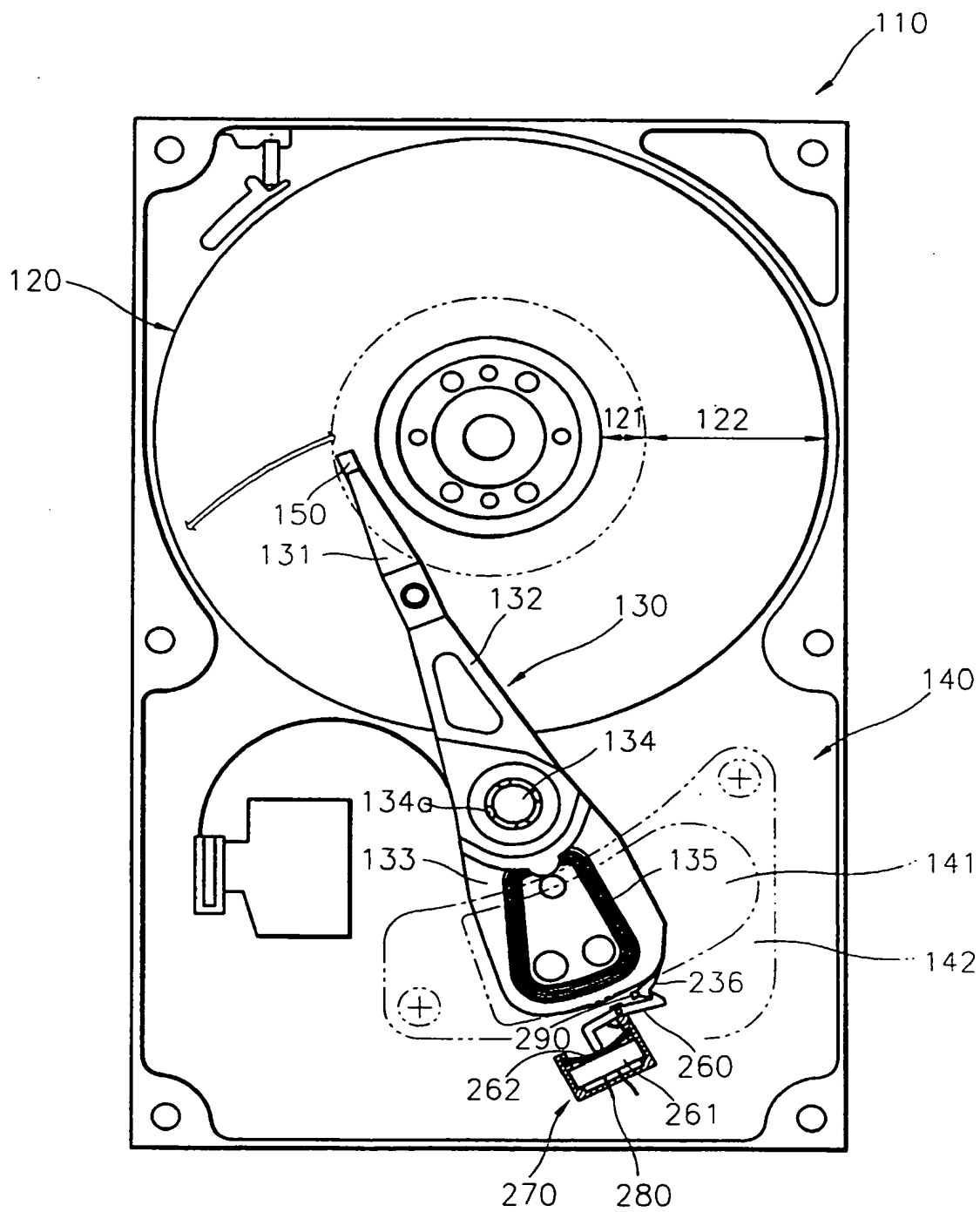


FIG. 6

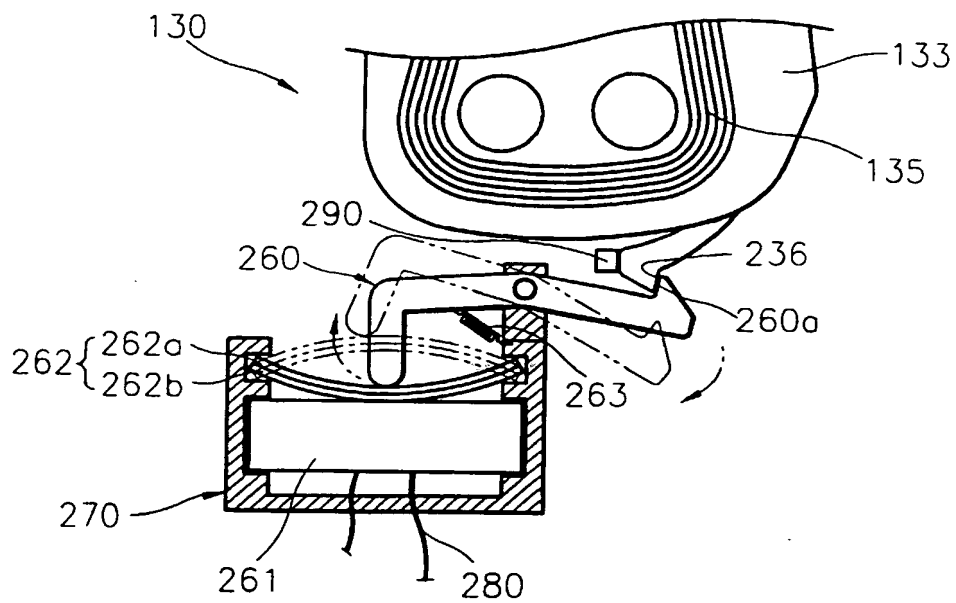


FIG. 7

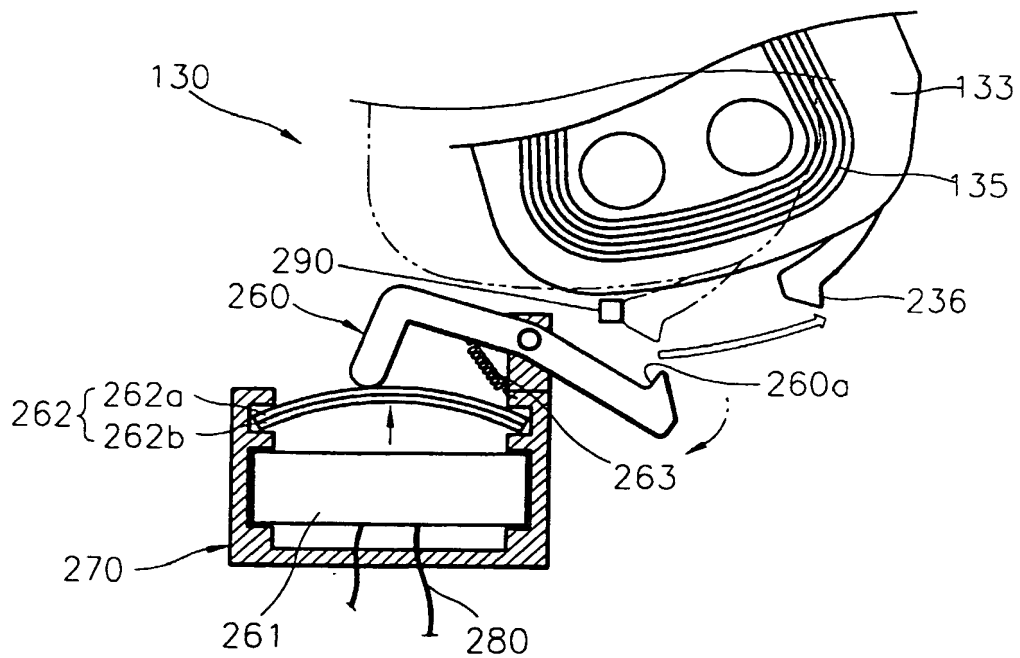


FIG. 8

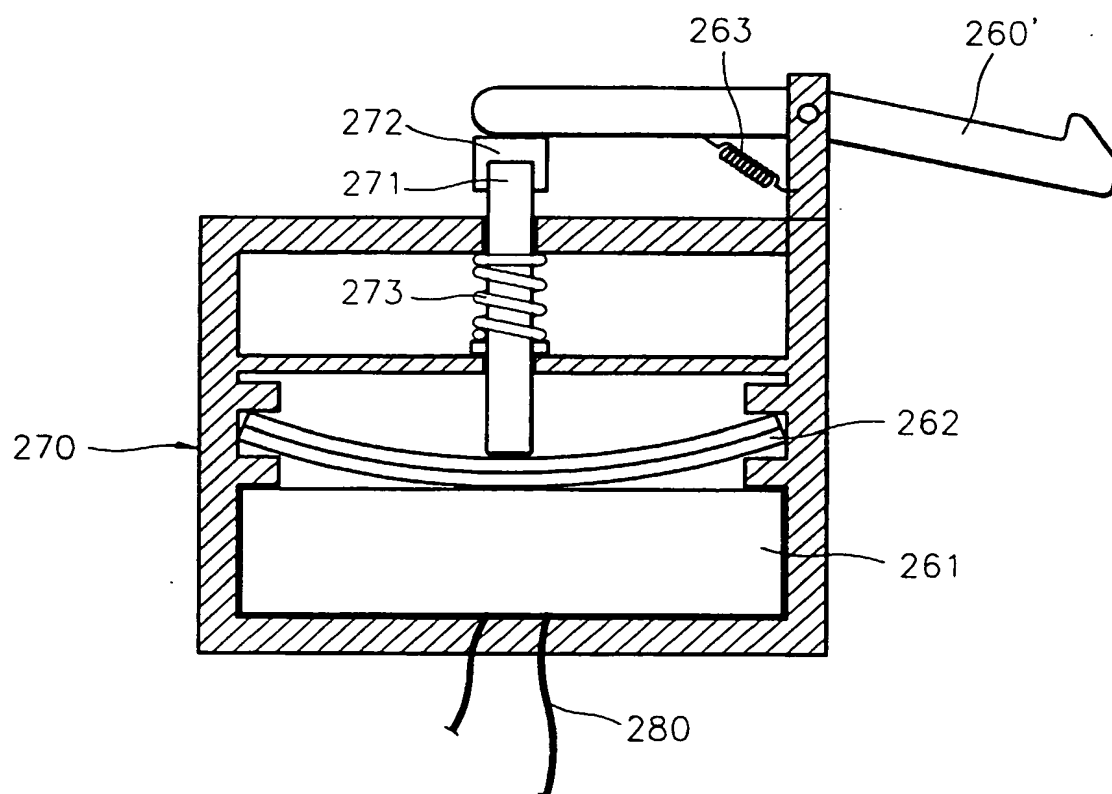


FIG. 9

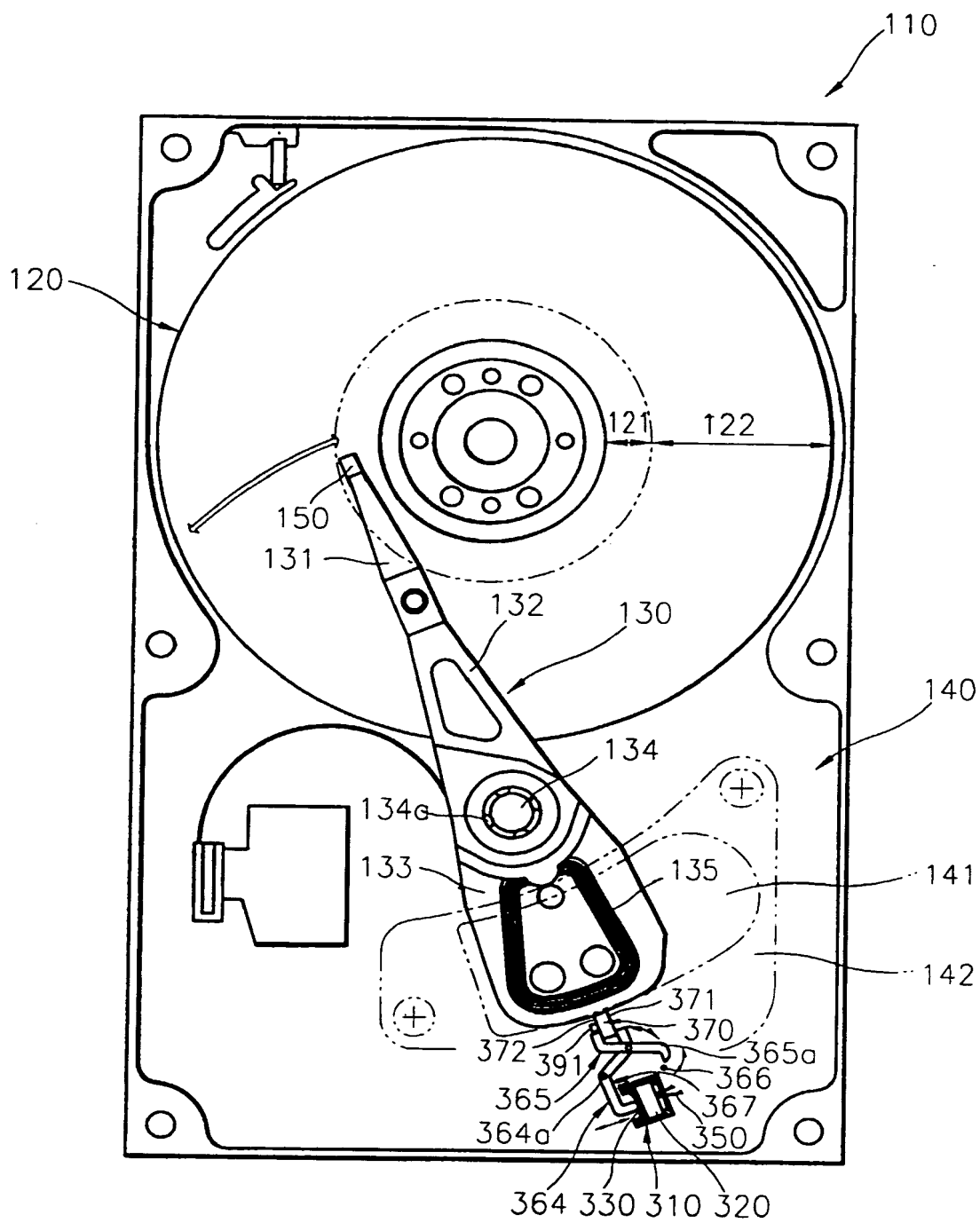


FIG. 10

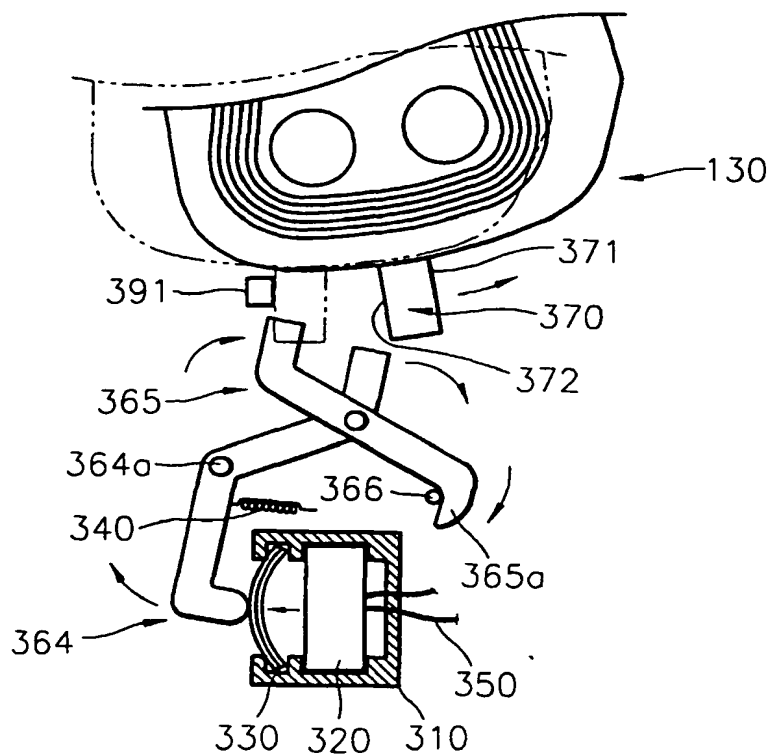
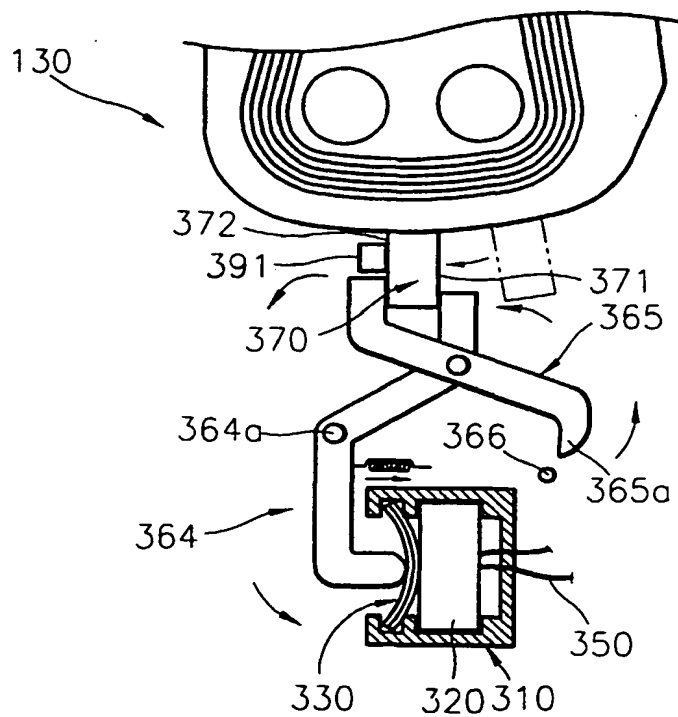


FIG. 11



**THIS PAGE BLANK (USPTO)**



(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 1 037 201 A3**

(12)

**EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
10.10.2001 Bulletin 2001/41

(51) Int Cl.7: **G11B 5/54, G11B 21/22**

(43) Date of publication A2:  
20.09.2000 Bulletin 2000/38

(21) Application number: **00113312.3**

(22) Date of filing: **21.08.1998**

(84) Designated Contracting States:  
**DE FR GB**

(30) Priority: **27.11.1997 KR 9763444**  
**30.12.1997 KR 9777801**

(62) Document number(s) of the earlier application(s) in  
accordance with Art. 76 EPC:  
**98306704.2 / 0 919 991**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**  
**Suwon-City, Kyungki-do (KR)**

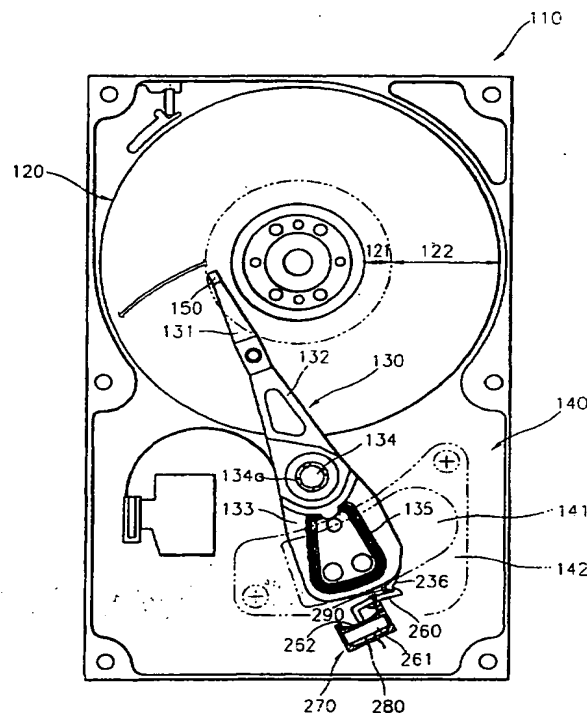
(72) Inventor: **Jang, Deok-hwan**  
**Paldal-gu, Suwon-city, Kyungki-do (KR)**

(74) Representative: **Perry, Julie Elizabeth**  
**15 Clare Road**  
**Halifax, West Yorkshire HX1 2HY (GB)**

**(54) Magnetic head transferring device of hard disk drive**

(57) In a magnetic head transferring device of a hard disk drive, to lock a rotor after the magnetic head is moved to a parking zone (121) formed on a hard disk (120), a bi-metal member (262) reversibly deforms when heated by an electric current supplied from a power supply source. The bi-metal member (262) is installed to be adjacent to an actuating part of a link member (260) and, when being heated by a predetermined heating source, deforms to enable movement of the link member such that a hook portion of the link member (260) can separate from a hook portion (236) of the rotor. Thus, since the rotation of the rotor (130) is locked or unlocked using the bi-metal member operating according to the turning on/off of power, an abnormal movement of the magnetic head (150) can be prevented regardless of the strength of external impacts.

**FIG. 5**



**EP 1 037 201 A3**



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 00 11 3312

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X A	US 5 019 932 A (IWATA AKITOSHI) 28 May 1991 (1991-05-28) * column 3, line 12 - column 4, line 21; figure 2 *	1,4,8 2,3,5-7	G11B5/54 G11B21/22
X	--- PATENT ABSTRACTS OF JAPAN vol. 005, no. 036 (P-051), 7 March 1981 (1981-03-07) & JP 55 157169 A (HITACHI LTD), 6 December 1980 (1980-12-06) * abstract *	1,4,8	
X	--- PATENT ABSTRACTS OF JAPAN vol. 015, no. 024 (P-1156), 21 January 1991 (1991-01-21) & JP 02 267786 A (NEC CORP), 1 November 1990 (1990-11-01) * abstract *	1,4,8	
X	--- PATENT ABSTRACTS OF JAPAN vol. 014, no. 438 (P-1108), 19 September 1990 (1990-09-19) & JP 02 172076 A (TOSHIBA CORP), 3 July 1990 (1990-07-03) * abstract *	1,4,8	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G11B
X	--- "BIOMETAL ACTUATED ACTUATOR LATCH" RESEARCH DISCLOSURE, KENNETH MASON PUBLICATIONS, HAMPSHIRE, GB, no. 345, 1993, page 50 XP000336504 ISSN: 0374-4353 * page 50 *	1,4,8	
A	--- EP 0 380 256 A (SEAGATE TECHNOLOGY) 1 August 1990 (1990-08-01) * column 6, line 7 - line 47 *	1-8	
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>16 August 2001</b>	Examiner <b>Ressenaar, J-P</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.92 (P04C01)

# **ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.**

EP 00 11 3312

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-08-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5019932 A	28-05-1991	JP 2172076 A KR 9302335 B	03-07-1990 29-03-1993
JP 55157169 A	06-12-1980	NONE	
JP 02267786 A	01-11-1990	NONE	
JP 02172076 A	03-07-1990	KR 9302335 B US 5019932 A	29-03-1993 28-05-1991
EP 0380256 A	01-08-1990	US 4996617 A CA 2008231 A JP 3198271 A KR 150450 B	26-02-1991 23-07-1990 29-08-1991 15-10-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**THIS PAGE BLANK (USPTO)**